

form of *Euchloë cardamines*, large and strong on the wing, the large orange tips covering quite two-thirds of the upper wing. *Pieris napi* var. *bryoniae* were common and fine on a stretch of the road about a mile and a half below Zermatt, one very large specimen being of a bright yellow ground colour. I once mistook it for *Colias phicomone*. On the 9th we walked up to the Gornergrat, seeing nothing on the way up, as the day was cloudy and threatening. The snow-line was high for the date, there being practically none till some distance above the Riffelberg Hotel, but the flowers made up for the want of Rhopalocera. We saw large slopes almost covered with the little *Gentiana verna*, with here and there a discordant colour caused by a large purple viola. The *Gentiana acaulis* was just coming out, and a yellow field above the Riffel Alp, which might have been cowslips at a distance, proved to be one mass of *Anemone sulphurea* above the snow-line, and between the deep drifts the large *Anemone alpina* was just lifting its oppressed head where the snow had melted. On the way down, at about 9000 feet, midway between the Gorner Grat and the Riffelberg, my wife noticed a white butterfly at rest on a stone, and as every butterfly at such an elevation should be arrested on suspicion, I transferred it to the killing bottle, and found I possessed a newly-emerged *Pontia callidice*, a species new to me. Suddenly the sun burst forth, and the level patch, partly green, partly snow, was alive with *P. callidice*, all perfect, and I secured a good series. To look on the unclouded Matterhorn, Monte Rosa, Breithorn, Castor and Pollux, and the Lyskamm, to stand on gentians and anemones, to catch a score of *P. callidice*, and to breathe the Alpine air of 9000 feet, made up an embarrassment of luxuries hard to beat. A single Erebiid, flying over a drift, looked intensely black against the snow, but it was impossible to pursue it; its size was halfway between *Melampias epiphron* and *Erebia aethiops*. On the way down through the pinewood below the Riffel Alp, *Leptosia sinapis*, as usual, abounded, and we saw a few *Agriades thetis* and *Cyaniris semiargus* with *Pontia daplidice* in the meadow at the foot of the slope, but it was too early for meadows at Zermatt, and the only good work that I did, except at the Gorner Grat, was on the rock-strewn slope towards Taesch, on the right bank of the Visp. A climb up the Trift Gorge was altogether unsuccessful; we saw nothing on the way up except a colony of *Nemeophila plantaginis*, and, on reaching our goal, which was a high level spot with sheds where cattle were kept in the summer months, we saw only one *Aglais urticae* settled on a dense scrub of nettles and dandelions which had elbowed the native gentians off their own ground. (Why do nettles invariably follow the tracks of humanity?) Considering the early date of our visit, and the unsatisfactory weather of the latter half, I was more than content with the fifty-eight species seen or taken, and the result has determined me, if possible, to devote a longer time, and cover more ground in the summer of 1910.

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### A note on hibernation in Lepidoptera.

By T. A. CHAPMAN, M.D.

The following observation seems of interest in its bearing on the conditions governing hibernation in insects. Hibernation in most species, I am thinking rather of lepidoptera, is a matter of inherited

habit and instinct, an individual of *Aglais urticae* may thus be constrained to commence hibernation in June, and a larva must die rather than hibernate, if unable to feed up to the proper stage. It is, no doubt, a matter of natural selection that the habit and the conditions (chiefly the seasons) shall be duly co-ordinated. The process or possibility of hibernation no doubt originated (at some remote epoch) in the quiescence of protoplasm at a low temperature and under starvation, but it is now something much more definite than this.

The faculty of, or capacity for, hibernation is rather a function of the protoplasm than of the organism as a whole. That it is so follows, I think, from these considerations; as a function of protoplasm it is not only of very ancient date, but must have taken a long period for its evolution, but, as we see it now, and if we regard it as a function of the organism, it is necessary to suppose that it can be developed or lost at very short notice. For instance, the cases are abundant in which closely allied species hibernate at different stages. The habit of hibernating as an egg can be comparatively quickly lost and replaced by hibernation as a half-grown larva (say *Agriades thetis* and *A. coridon*) or vice versa, or the change may be from pupa to imago (*Araschnia levana* and *Aglais urticae*), etc. It would seem, therefore, that, though the definite power to hibernate must have been of slow evolution, the decision as to the stage in the insect's life at which this power shall be exercised is capable of much more rapid variation. For this, possibly a very few generations will suffice, the motive for the change being that the natural stimulants to hibernation be brought to bear at a different stage. The following observations on *Leioptilus tephradactyla* show that questions of food still have a determining power, if not on the commencement of hibernation, at least on the date of its termination, and that not merely an increase of temperature is necessary to this end, but, in some larvæ, at least, the protoplasm does not give up the hibernating attitude till fresh nutriment is supplied to it, but once the attitude is yielded it cannot be resumed. This last remark, as more than a statement of a special case, is flatly contradicted by an observation on *Pselnophorus brachydactylus*, of which several hibernated larvæ, instead of going ahead with their brethren on the spring awakening, fed a little, moulted once (one twice), and finished by starting hibernating again, to appearance, in the same instar in which they had already hibernated; a very similar occurrence is not unusual in Anthrocerids.

During the winter of 1909-10 I had hibernating a number of larvæ of *L. tephradactyla* on plants of *Solidago virgaurea* in three flower-pots. They were, however, somewhat neglected, and, on examining them at the end of March, I found that the plants in two pots were apparently dead, that in the third, however, in fair condition. Very few of the larvæ were, however, dead, but several on the living plant seemed to be eating a little. Having to leave home, I put all the larvæ on the living plant, and left them to their fate till May 16th. I then found that the living plant had been eaten away, a few larvæ still nibbling at stumps. A few larvæ were dead, from starvation almost certainly, several hardly grown at all, but most had moulted at least once, and were somewhat advanced. The living larvæ were at all stages up to half-grown in last skin.

I then found that, in one of the pots, laid aside as having the

plants dead, the plant was alive, and had three larvæ on a bud just showing itself, these had grown slightly, one rather more than the others. At another place in the pot were three other larvæ, fairly close together, possessed, one supposes, with some hope that a bud would come up at that place, though examination showed that the hope was without foundation.

These six larvæ had, of course, been so hidden that I had passed them over when clearing the pot of larvæ at the end of March. The points that strike one as interesting are that those larvæ that were on a living plant grew more or less till starvation set in, and that then a certain proportion, no doubt those that failed to obtain any of the failing supplies, died, and not less those that had thriven and grown, than those less forward. On the supposed dead plant there were, however, six larvæ, all alive and well, and a careful search failed to discover a dead one. The three away from the newly-appearing shoot were very small, smaller if anything than before hybernation, actually 2.8mm. long, and very slender, those on the, no doubt, quite recent shoot were a little larger.

It would, therefore, appear that, when all circumstances are favourable for renewed activity in the spring, if food is present, all goes well, but if it is not, the larvæ can prolong their winter activity without serious damage for at least six weeks (no doubt allowance must be made for the weather during much of the period not being of a forcing character). But if they obtain food, and make more or less progress, and are then starved, they die within the total period of six weeks, which has been comparatively harmless to their apparently more ill-used brethren who have had no food at all.

I ought to state that the two pots were out-of-doors, exposed to the same weather together.

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### ***Fredericina calodactyla* (zetterstedtii).**

By T. A. CHAPMAN, M.D.

Mr. Goodwin's notes on this species in *Ent. Record*, vol. xxi., 1909, p. 205, interested me very much, and I am indebted to him for the opportunity of verifying the point that seemed of most importance, viz., the habit of the pupa of leaving its puparium for emergence. I was not only able to verify this, but to note that the pupa emerged in this way, and again retreated if disturbed, for at least some days before emergence. I further found that the emergence of the pupa to a dangerous or inconvenient extent is checked by a cremastral silken cable. The length of freedom allowed being approximately the length of the pupa.

My notes are that on May 23rd, 1910, Mr. E. Goodwin, of Canon Court, sent me some material of *F. calodactyla* (*zetterstedtii*). One of the larvæ, in its burrow in the heart of the growing stem (or almost rootstock) of *Solidago*, was laid up for its moult to pupa, which occurred a day or two after. Looking at it frequently, I noticed nothing particular in connection with it till June 2nd, when I observed the pupa well above its usual level in its burrow or cocoon, it might almost be called projecting; looking more carefully, I very shortly shook or otherwise disturbed it, when it at once retreated to its usual position, doing so quickly and actively, and making some active movements when I so